INTERNATIONAL STANDARD

ISO 28219

Second edition
2017-09

Packaging — Labelling and direct product marking with linear bar code and two-dimensional symbols

Emballage — Étiquetage et marquage direct sur le produit avec un code à barres et des symboles bidimensionnels

Reference number
ISO 28219:2017(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 122, *Packaging*.

This second edition cancels and replaces the first edition (ISO 28219:2009), which has been technically revised.

Introduction

Today, global industries widely use machine-readable markings on products for inventory control, quality control, and product life cycle management. Common technologies, data structures, conformance, and applications standards are necessary to enable all trading partners to use such markings internally and throughout the supply chain.

A number of different product labelling and marking standards exist, each designed to meet the requirements of the specific industry sector. For effective and economic use within and between industry sectors, one common multi-industry standard is a necessity.

A standard linear bar code or two-dimensional symbol marked on a product or part will facilitate the automation of inventory control, quality control, and product life cycle management. The linear bar code or two-dimensional symbol information on the product can be used as a key to access the appropriate database that contains detailed information about the product, including information transmitted via EDI. In addition, a product mark can contain other information as agreed between the trading partners.

This document does not supersede or replace any applicable safety or regulatory marking or labelling requirements. This document is meant to satisfy the minimum product package requirements of numerous applications and industry groups. As such, its applicability is to a wide range of industries, each of which can have specific implementation guidelines for this document. This document is intended to be applied in addition to any other mandated labelling requirements.

This document supersedes and replaces ANS MH10.8.7.

This document supersedes and replaces CEA-802.

This document supersedes and replaces CEA-621-A.

Packaging — Labelling and direct product marking with linear bar code and two-dimensional symbols

1 Scope

This document

— defines minimum requirements for identifying items,

— provides guidelines for item marking with machine-readable symbols,

— covers both labels and direct marking of items,

— includes testing procedures for label adhesive characteristics and mark durability,

— provides guidance for the formatting on the label of data presented in linear bar code, two-dimensional symbol or human-readable form,

— is intended for applications which include, but are not limited to, support of systems that automate the control of items during the processes of:

  — production,

  — inventory,

  — distribution,

  — field service,

  — point of sale,

  — point of care,

  — repair, and

— is intended to include, but it is not limited to, multiple industries including:

  — automotive,

  — aerospace,

  — chemical,

  — consumer items,

  — electronics,

  — health care,

  — marine,

  — rail,

  — telecommunications.

The location and application method of the marking are not defined (these will be reviewed and agreed upon by suppliers and manufacturers and their trading partners before implementing this document).

This document does not supersede or replace any applicable safety or regulatory marking or labelling requirements. This document is meant to satisfy the minimum item marking requirements of numerous applications and industry groups and as such its applicability is to a wide range of industries, each of which may have specific implementation guidelines for it. This document is to be applied in addition to any other mandated labelling direct-marking requirements.

The labelling and direct marking requirement of this document and other standards can be combined into one label or marking area or appear as separate labels or marking areas.

This document uses the terms “part marking” and “item marking” interchangeably. Unless otherwise stated, this document will use the term “item marking” to describe both the labelling and direct part marking (DPM) of an item, where DPM includes, but is not limited to, altering (e.g. dot peen, laser etch, chemical etch), as well as additive type processes (e.g. ink jet, vacuum deposition).

The purpose of this document is to establish the machine-readable (linear, two-dimensional, and composite symbols) and human-readable content for direct marking and labelling of items, parts, and components.

This document provides a means for items, parts and components to be marked, and read in either fixtured or hand-held scanning environments at any manufacturer’s facility and then read by customers purchasing items for subsequent manufacturing operations or for final end use. Intended applications include, but are not limited to, supply chain applications, e.g. inventory, distribution, manufacturing, quality control, acquisition, transportation, supply, repair, and disposal.

The figures are illustrative and not necessarily to scale or to the quality requirements specified in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 21067, *Packaging — Vocabulary*

ISO/IEC 646, *Information technology — ISO 7-bit coded character set for information interchange*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*

ISO/IEC 15415, *Information technology — Automatic identification and data capture techniques — Bar code symbol print quality test specification — Two-dimensional symbols*

ISO/IEC 15416, *Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols*

ISO/IEC 15417, *Information technology — Automatic identification and data capture techniques — Code 128 bar code symbology specification*

ISO/IEC 15434, *Information technology — Automatic identification and data capture techniques — Syntax for high-capacity ADC media*

ISO/IEC 15438, *Information technology — Automatic identification and data capture techniques — PDF417 bar code symbology specification*

ISO/IEC 15459-2, *Information technology — Automatic identification and data capture techniques — Unique identification — Part 2: Registration procedures*

ISO/IEC 16022, *Information technology — Automatic identification and data capture techniques — Data Matrix bar code symbology specification*

ISO/IEC 16388, *Information technology — Automatic identification and data capture techniques — Code 39 bar code symbology specification*

ISO/IEC 18004, *Information technology — Automatic identification and data capture techniques — QR Code bar code symbology specification*

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

ISO/IEC 24723, *Information technology — Automatic identification and data capture techniques — GS1 Composite bar code symbology specification*

ISO/IEC 24728, *Information technology — Automatic identification and data capture techniques — MicroPDF417 bar code symbology specification*

ANS ATIS-0300213, *American National Standard for Telecommunication — Coded Identification of Equipment Entities of the North American Telecommunications System for Information Exchange*

ANS MH10.8.2, *Data Application Identifier Standard*

Dun & Bradstreet (D&B), *DUNS®*[1)]*Number*

GS1, *General Specifications*

NAMSA, *ACodP-1(D)*, Chapter 2, Subsection 242-243, (NCAGE)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762 and ISO 21067 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
cell
smallest element of a two-dimensional matrix symbol

3.2
CLEI™[2)] **code**
coding structure maintained by Telcordia d.b.a. iconectiv that identifies communications equipment and describes product type, features, source document and associated drawings and vintages per ANS ATIS-0300213

3.3
components
parts (bare printed circuit board, integrated circuits, capacitor, diodes, switch, valve, spring, bearing, bracket, bolt, etc.) of a *first level/modular assembly* (3.6)

3.4
data element separator
specified character used to delimit discrete fields of data

1) DUNS® Number is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

2) CLEI™ coder is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

3.5
DUNS®[3] Number
nine-digit number, issued by D&B, assigned to each business location in the D&B database, having a unique, separate, and distinct operation for the purpose of identifying them

3.6
first level
modular assembly
manufactured item (3.8) (populated printed circuit board, hydraulic pump, starter, dashboard assembly, door assembly, etc.) made up of *components* (3.3)

3.7
Global Trade Item Number
GTIN
GS1 identification key used to identify trade items

Note 1 to entry: The key comprises a GS1 Company Prefix, an item reference and a check digit.

3.8
item
product
first level or higher assembly that is sold in a complete end-usable configuration

3.9
label
adhesive backed media capable of being marked with information in machine-readable and/or human-readable form

Note 1 to entry: Both labels and direct marking methods are referred to in this document under the term “label”.

3.10
manufacturer
actual producer or fabricator of an *item* (3.8), not necessarily the *supplier* (3.11) in a transaction

3.11
supplier
party that produces, provides, or furnishes an *item* (3.8) or service

3.12
traceability identification
string of characters assigned to identify or trace an entity or a unique group of entities (e.g. lot, batch, *item* (3.8), revision/version or serial number)

4 Requirements

4.1 Identification

4.1.1 General

Enterprises may choose to assign uniqueness to items at the individual, group, or product level. Individual uniqueness requires serialization or one-of-a-kind production, see 4.1.2 and 4.2.3.3. A lot or batch number captures group uniqueness, see 4.1.3 and 4.2.3.3. A product code is an example of item uniqueness, see 4.2.3.4.

3) DUNS® Number is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

4.1.2 Unique item identification

Items may be assigned a unique item identification code to each instance of the item, i.e. serialization. Serial numbers shall be unique either within an enterprise ID or within enterprise ID + part number. When using unique identification, the encoded symbol shall contain only one enterprise identifier, serial number and/or original part number to avoid confusion and ensure uniqueness.

4.1.3 Lot or batch identification

Items can have group uniqueness applied by an enterprise. Some items are assigned group identification, e.g. lot or batch number.

4.2 Data format common requirements

4.2.1 General

Those implementing this document should refer to the guidelines for their particular industries. For a partial list of industry guidelines, see the Bibliography.

4.2.2 General format

4.2.2.1 Overview

Labels will accommodate both mandatory and optional data fields. The maximum length of each discrete data field shall be 25 data characters unless otherwise specified. This character count is exclusive of overhead characters.

See Annex H for information on serialization of some electronic products.

All data elements encoded in a machine-readable medium shall be preceded by the appropriate Data Identifier (DI) as defined in ANS MH10.8.2 Data Identifier, or the appropriate Application Identifier (AI) defined in the GS1 General Specifications. The exceptions to this rule are the UPC-A, UPC-E, EAN-8, and EAN-13 symbologies.

The choice between DIs and GS1 AIs, for any user, will normally be determined in the applicable industry convention being followed.

Other industries developing item identification conventions should consider business practices, information requirements and systems capabilities of the trading partners in choosing between DIs and GS1 AIs. See Annex B for a list of commonly used DIs and the equivalent AIs.

The character set shall be upper case alphabetic characters (A to Z), numeric digits (0 to 9), and the five characters [dash (–), period (.), space ( ), solidus (/) and plus sign (+)], as permitted within the applicable identifier standard, ANSI MH10.8.2 or the GS1 General Specification. Further, the recommended field separators, record separators, segment terminators and compliance indicator contained in ISO/IEC 15434 are part of the allowable character set. A table of these characters and their hexadecimal and decimal equivalent is given in Annex C. The actual character set employed conforming to this document shall be the character set permitted by the data field and not the symbology. It is recommended that the resultant data stream from scanning a 2D symbol follow the syntax described in ISO/IEC 15434. See Annex D for guidance on the implementation of the ISO/IEC 15434 data syntax.

4.2.2.2 Data identifiers (DIs)

The descriptions in the DI list are general in nature and are used in industrial and international applications. Specific application guidelines provide the detailed definition used among trading partners.

The full list of registered DIs and the full specification for their use are found in the American National Standard MH10.8.2.

DIs may be used with any alphanumeric data carrier and are designed to ensure cross-industry commonality of Data Identifiers used in automatic identification technologies.

DIs have a format of one alphabetic character alone or one alphabetic character prefixed by one, two or three numeric characters.

4.2.2.3 GS1 Application Identifiers (AIs)

The definitions of the GS1 AIs are supported by application guidelines. The GS1 AIs, and associated guidelines, have been designed for international and multi-sector trading purposes.

The GS1 item identification system and related encoding standard are complemented by the GS1 maintained AIs. This document comprises two principal elements, which are the key to any encoding system: the data content and the data carrier.

The use of GS1 AIs is subject to the rules established by GS1.

GS1 AIs identify generic and simple data fields for use in cross-sector and international supply chain applications. The GS1 General Specifications provide rules for the definition, format and structure of the data fields.

Each GS1 AI consists of two, three or four characters.

4.2.2.4 Organization inclusion in coding

It is recommended that data structures used to identify items or the traceability of items include identification of the organization providing the coding, as well as the specific coding structure.

In the GS1 General Specifications, this coding structure is the GS1 Company Prefix portion of the global trade item number (GTIN).

When telecommunications companies use the CLEI Code, the coding structure is specified in ANS ATIS-0300213. The CLEI Code is always 10 characters and the structure is as follows: a basic code (four alphanumeric characters) representing the technology or equipment type and consisting of a family code (two alphanumeric characters), sub-family code (two alphanumeric characters), a features code (three alphanumeric characters) to represent attributes of the equipment, reference code (one alphanumeric character) to represent the manufacturer of the equipment within the basic code and a complemental code (two alphanumeric characters) to identify vintage or version of the equipment. When using DIs, this coding structure uses the issuing agency code (IAC) established in ISO/IEC 15459-2 and the company identification number (CIN) assigned by the issuing agency.

See Annex G for information about the register of issuing agency codes (IACs) for ISO/IEC 15459.

4.2.3 Mandatory data fields

4.2.3.1 General

Mandatory data fields are given in Table 1.

Table 1 — Item identification code type

Item identification type	Mandatory fields
1. Commodity	Item identification code (example nails)
2. Non-traceable	Enterprise identification code
	Item identification code
3. Group traceability	Enterprise identification code
	Item identification code
	Unique lot or batch traceability code
4. Unique serialization within item identification code	Enterprise identification code
	Item identification code
	Unique individual item identification code
5. Unique serialization within enterprise	Enterprise identification code
	Unique item traceability code within enterprise identification code

The enterprise identification code and item identification code may be combined in a single data field, see 4.2.3.4.

4.2.3.2 Enterprise identification code

The enterprise identification code shall use formats contained in Table 2 and Table 3. The use of more than one enterprise identification code preceded by DI 20V is permitted on an item. The choice of enterprise identification code(s) should be mutually agreed upon between trading partners. The appropriate DI shall precede the enterprise identification when separate data fields are used to identify the supplier and the item identification.

Table 2 — Data Identifiers used for enterprise identification

Data Identifier	Data field	Data characteristics Type followed by the number of characters (e.g. a#, n#, an#)[a]	Description
18V	Combined IAC/CIN	an3+an1..3+an3..13	Combined IAC/CIN
12V	DUNS® Number Identifying Manufacturer	an3+n9	Entity (manufacturer) identification assigned by Dun and Bradstreet
17V	US Department of Defence (DoD) CAGE Code/NAMSA NCAGE	an3+an5	Company identification assigned by the US Department of Defence
20V	Company identification	an3+an1..3+an3..13+“+”+an3	Combined IAC/CIN and Party Qualifier Code (EDIFACT DE 3035)
21V	Supplier identification	an3 +an...25	Combined IAC/CIN followed by an internally assigned entity identification

[a] The characters before the first “+” symbol describe the format of the DI or AI. Note that the “+” symbols are not encoded in the data except for “+” in 20V.

Table 3 — Application Identifiers used for enterprise identification

Application Identifier	Data field	Data characteristics Type followed by the number of characters (e.g. a#, n#, an#)[a]	Description
N/A	Part number (supplier/item) UPC-A (GTIN-12)	n12	UPC-A Symbology (combination of supplier and item identification)
N/A	Part number (supplier/item) EAN-13 (GTIN-13)	n13	EAN-13 Symbology (combination of supplier and item identification)
01	Part number (supplier/item and quantity) GTIN-14	n2+n14	GS1–128, GS1 Data Bar Expanded and GS1 Data Matrix (combination of indicator digit, supplier and item identification)

[a] The characters before the first "+" symbol describe the format of the DI or AI. Note that the "+" symbols are not encoded in the data.

4.2.3.3 Group and item traceability identification

The traceability identification is assigned by the manufacturer or supplier. The DIs or AIs given in Table 4 and Table 5 represent a partial list of the ASC MH10 Data Identifiers and GS1 Application Identifiers that may be applicable to traceability identification.

The maximum length of a single traceability identification data field should not exceed 35 characters, which excludes the associated DI or AI. The traceability identification data field shall not exceed 50 characters.

Table 4 — Data Identifiers used for traceability identification

Data Identifier	Data field	Data characteristics Type followed by the number of characters (e.g. a#, n#, an#)[a]	Description
S	Serial number	an1+an...20	Serial number or code assigned by the supplier to an entity for its lifetime
18S	Serial number within CAGE Code	an3+an...20	Serial number or code assigned by the CAGE Code that is unique within CAGE Code
20S	Customer assigned serial number	an3+an...20	Serial number or code assigned by the customer to an entity for its lifetime
22S	Cellular Mobile Telephone (CMT) Electronic Serial Number	an3+an...25	Electronic Serial Number (ESN) for Cellular Mobile Telephones or the Mobile Equipment Identifier (MEID) or the International Mobile Station Equipment Identity (IMEI)

[a] The characters before the first "+" symbol describe the format of the DI. Note that the "+" symbols are not encoded in the data.

20S may be used by industries that are serializing items that were not serialized by the manufacturer at time of manufacturing.

Asset identifiers shall not be used for any other purpose and shall remain unique for a period well beyond the lifetime of relevant records. If a company assigns asset identifiers to trade items supplied to its customers, the company shall ensure that the asset identifiers are never reused.

The length specified in the table may be shorter than the length specified in the reference standard; however, that is the maximum length specified in this document.

NOTE 1 The variable lengths for the IAC/CIN combined lengths are defined by ISO 15459.

NOTE 2 See ESN Assignment Guidelines and Procedures and MOBILE EQUIPMENT IDENTIFIER (MEID) GHA (Global Hexadecimal Administrator) Assignment Guidelines and Procedures for additional information on ESN and MEID.

Table 4 *(continued)*

Data Identifier	Data field	Data characteristics Type followed by the number of characters (e.g. a#, n#, an#)[a]	Description
25S	Serial number	an3 +IAC/CIN+an...20	Combined IAC/CIN and the serial number assigned by the supplier
+$+	Serial number	an3+an...18	HIBC Serial Number associated with HIBC Lot/batch number (+$) option
1T	Lot/batch number	an2+an...20	Lot/Batch Number defined by the manufacturer
25T	Lot/batch number	an3 +IAC/CIN+an...20	Combined IAC/CIN and enterprise identification and lot or batch number assigned by the supplier
+$	Lot/batch number	a2+an..18	Options of concatenated lot or batch combinations with item data are specified with ANSI/HIBC 2

[a] The characters before the first "+" symbol describe the format of the DI. Note that the "+" symbols are not encoded in the data.

20S may be used by industries that are serializing items that were not serialized by the manufacturer at time of manufacturing.

Asset identifiers shall not be used for any other purpose and shall remain unique for a period well beyond the lifetime of relevant records. If a company assigns asset identifiers to trade items supplied to its customers, the company shall ensure that the asset identifiers are never reused.

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NOTE 1 The variable lengths for the IAC/CIN combined lengths are defined by ISO 15459.

NOTE 2 See ESN Assignment Guidelines and Procedures and MOBILE EQUIPMENT IDENTIFIER (MEID) GHA (Global Hexadecimal Administrator) Assignment Guidelines and Procedures for additional information on ESN and MEID.

Table 5 — Application Identifiers used for traceability identification

Application Identifier	Data field	Data characteristics Type followed by the number of characters (e.g. a#, n#, an#)[a]	Description
10	Batch/lot number	n2+an...20	Traceability identification defined by the manufacturer
11	Production date	n2+n6[b]	Production date (YYMMDD)
21	Serial number	n2+an...20	Serial number or code assigned by the supplier to an trade item for its lifetime

[a] The characters before the first "+" symbol describe the format of the AI. Note that the "+" symbols are not encoded in the data.

[b] Production date code construction using GS1 Application Identifiers use a two-digit designation for year.

Asset identifiers shall not be used for any other purpose and shall remain unique for a period well beyond the lifetime of relevant records. If a company assigns asset identifiers to trade items supplied to its customers, the company shall ensure that the asset identifiers are never reused.

The length specified in the table may be shorter than the length specified in the reference standard; however, that is the maximum length specified in this document.